

Placemaking Through Innovation Districts: A Johns Hopkins Perspective

June 23, 2016

■ Two Main Topics:

- MACRO: Innovation drivers

- MICRO: Placemaking drivers

Overall GSSC Objective

- **Eliminate disease from the face of the planet by the end of the century by:**
 - Advancing Health, Science and Education
 - Fostering Collaboration across Government, Higher Education and Industry
 - Creating efficiencies in the Global Healthcare Markets
 - Developing Great Places to Live, Learn, Work & Play

1. Background

The Mission of Hopkins

On September 12, 1876, the crowd overflowing the auditorium of Baltimore's Academy of Music was in a mood of hopeful excitement, but excitement without frivolity. It was to mark the launching of the Johns Hopkins University, an institution whose leaders intended not simply to found a new university but to change all of American education; indeed, they sought considerably more than that. They planned to change the way in which Americans tried to understand and grapple with nature.

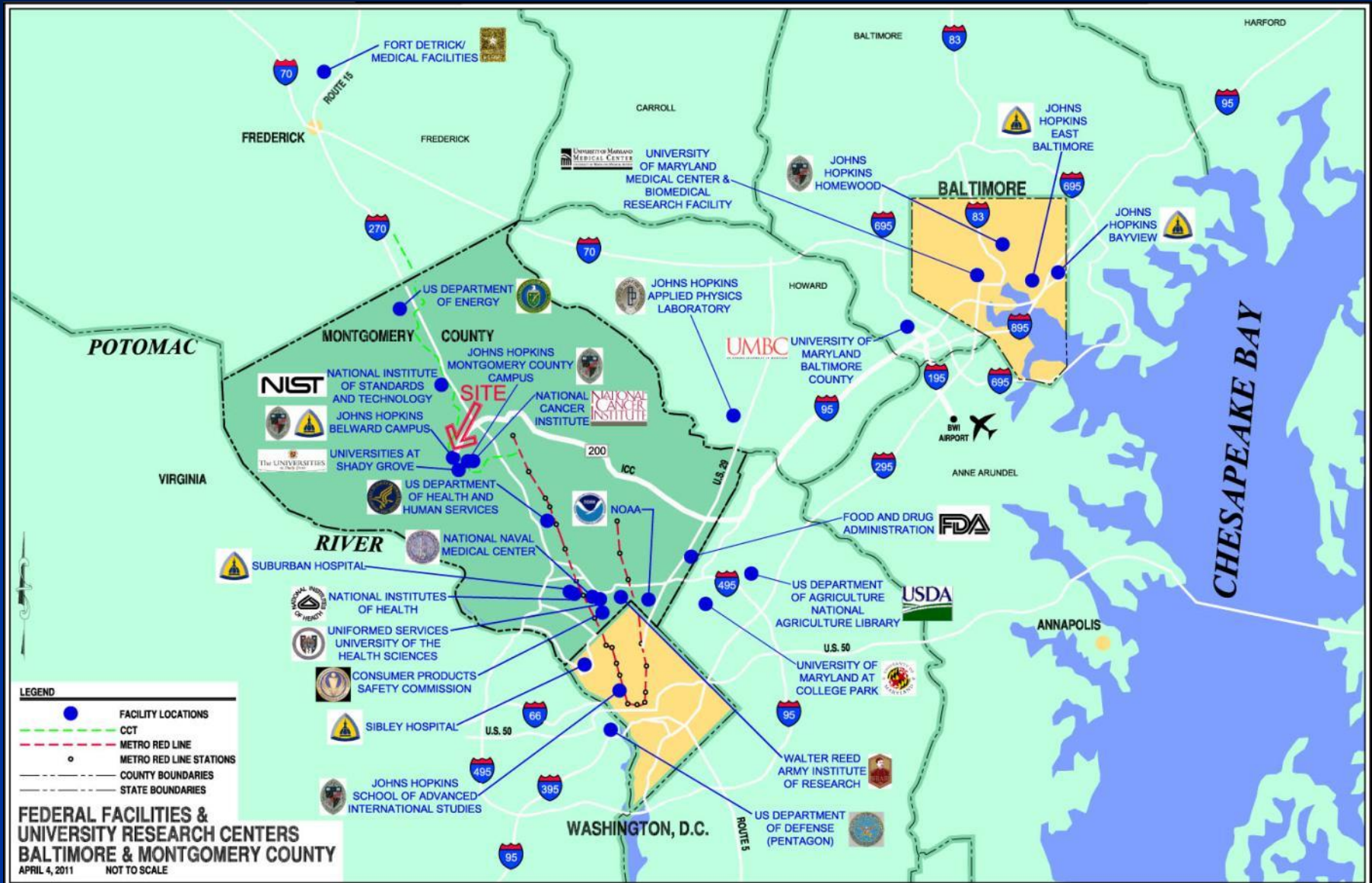
-excerpt from *The Great Influenza: The Epic Story of the Deadliest Plague in History*

John M. Barry

JOHNS HOPKINS

- **Largest private employer in Maryland: 50,000 + employees**
 - **First in R&D expenditures in the U.S. for 30 + years**
 - **18 campuses and centers in Maryland**

Regional Science Assets



Global Science Assets



PART A.
MACRO:
INNOVATION DRIVERS

2. Vision for a World Class Campus

Advancing Science In Maryland – Global Context

52 Key Competitors

North America (15)

- Austin, TX, USA
- **Baltimore/Washington, DC, USA**
- Boston, MA, USA
- Los Angeles, CA, USA
- Minneapolis / St. Paul, MN, USA
- Montreal, Canada
- New York/New Jersey, USA
- Philadelphia, PA, USA
- Research Triangle, NC, USA
- Rochester, NY, USA
- San Diego, CA, USA
- San Francisco, CA, USA
- Saskatoon, Canada
- Seattle, WA, USA
- Toronto, Canada

United Kingdom / Ireland (5)

- Cambridge - SE England
- Dublin, Republic of Ireland
- Glasgow / Edinburgh, Scotland
- London, England
- Manchester / Liverpool, England

Central America / South America (3)

- Belo Horizonte / Rio de Janeiro, Brazil
- Sao Paulo, Brazil
- West Havana, Cuba

Continental Europe (8)

- BioAlps, France / Switzerland
- Biovalley, France / Germany / Switzerland
- Brussels, Belgium
- Helsinki, Finland
- Medicon Valley, Denmark / Sweden
- Paris, France
- Sophia-Antipolis, France
- Stockholm / Uppsala, Sweden

Africa (1)

- Capetown, South Africa

Mideast (1)

- Israel

Asia (14)

- Bangalore, India
- Beijing, China
- Dengkil, Malaysia
- Hokkaido, Japan
- Hong Kong, China
- Hsinchu, Taiwan
- Hyderabad, India
- Kansai, Japan
- New Delhi, India
- Shanghai, China
- Shenzhen, China
- Singapore
- Taipei, Taiwan
- Tokyo-Kanto, Japan

Australia / New Zealand (4)

- Brisbane, Australia
- Dunedin, New Zealand
- Melbourne, Australia
- Sydney, Australia

1991: India Creates a 17-Year Road Map

STEP 1: Identify Four Key Growth Sectors

- IT, Biotechnology, Food Technology, Nano Technology

STEP 2: Reform the Educational System to Create a Skilled Workforce

- The India Institute of Technology and other Indian universities now graduate 360,000 engineers each year
- U.S. graduates 60,000 engineers each year

STEP 3: Create Employment Opportunities

- **EARLY '90s:** Two Bell Lab campus equivalents for I.T.
- **BY 2008-2010:** 22 I.T. campuses with 4 million jobs

STEP 4: India 2006

- **Information Technology**
 - Expected to reach US\$ 57 Billion Market by 2008
- **Biotechnology** \$5 Billion by 2010



Biopolis 10-year plan: 12 million square feet



(left)
Biopolis
Biomedical
Sciences
2000-2008



(below)
Fusionopolis
IT and Media
Done in 2007

(above)
Vista
Corporate,
Entertainment &
Transportation



Global Competition – Singapore

Commercialization –21 Portfolio Companies

Drug Discovery & Development



Biologics & Cell Therapy



Medtech Tools & Technology



New Songdo City: 58 million square feet under construction

Research Campus Precedents

General Information

New Songdo City

- Location:
 - Songdo City, Incheon, South Korea
- Geographic Description:
 - 2 miles from Incheon City
 - 25 miles Southwest of Seoul
 - Seoul population: 12 million
 - 15 miles from world's second largest airport (completed April 2001)

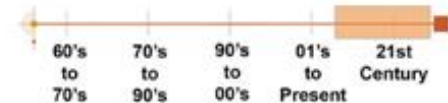
- Developer:
 - The Gale Company

- Architect:
 - Kohn Pedersen Fox Associates PC

- Project Description:
 - 1,376 acres, multi-phase construction over 10-year period beginning in 2004.

- Parking:
 - 42,000-Car Below-Grade Garages
 - 15,200,000 SF
- Central Park: 60 acres
- Central Park Garage: 2,600,000 SF
- Office Space: 13,600,000 SF
- Residential Space: 15,000,000 SF
- Retail Space: 3,000,000 SF
- Hotel Space: 1,000,000 SF

- Hospital/Medical Center: 1,600,000 SF
- Cultural/Educational/Govt.: 7,000,000 SF
- Total: 59,200,000 SF



Parking/ Mass Transit

- Integrated a combination of below and above grade garages throughout the city.



Character/ Density

- Urban core
- Central Park: 101-acre green space with cultural, retail, residential, & commercial buildings; its perimeter provides an open visual connection between the different districts.
- The MP includes several green spaces, and a canal system for transportation and recreation.



Building Height

- > than 200'
- Upon completion, government, research, cultural, office, convention, retail and residential facilities will be integrated on less than 1,000 acres.



NEW SONGDO CITY
Seoul, Korea

JOHNS HOPKINS BELWARD RESEARCH CAMPUS
Gaithersburg, MD

January 23, 2006

Guangzhou 5-year plan: 100 million square feet



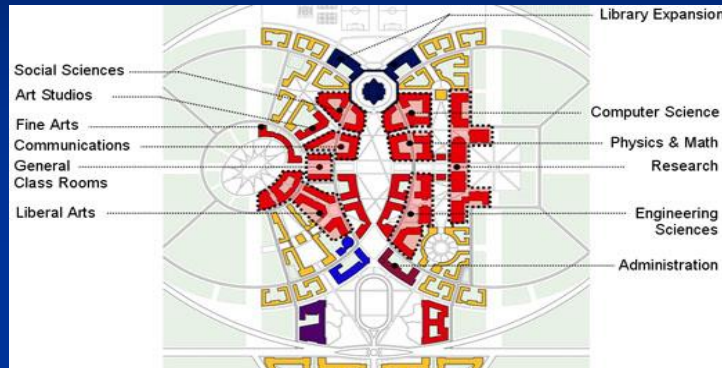
100 million square-feet
for 250,000 students and
60,000 faculty and
staff...

...IN 5 YEARS!

Asia's "World Class" Campuses

% GDP in R&D and Scale

and Transit Oriented with Mixed Uses



Vedanta – India - 52 m sf



New Songdo City – South Korea – 60 m sf



Biopolis – Singapore – 12 m sf



Guangzhou – China – 100 m sf

“World Class” Campuses

Lessons Learned

A “World Class” Applied Science Community includes:

- An Active Mix of Uses: Work and Live and Play
- Employees: Attracting the Creative Class
- Smart Growth: Transit Oriented Development
- Collaboration: Electronic and People Networks
- Density: Research is a Contact Sport=Tall Bldgs/Avoid Isolation
- Scale: Global Competitors Run from 12 to 100 M sf
- Long Term Federal Support: Increase % GDP to Research
- Entrepreneurs, Collaboration Managers & Private Capital
- Speed To Market: Asia – 10 year Build Outs

How Do We Compare in the Global Economy ?

Globalization of Technology

The **Technology Imperative** is:

- R&D Drives New Technology
- Technology Drives Industrial Growth
- Investment in R&D Drives Industrial Growth

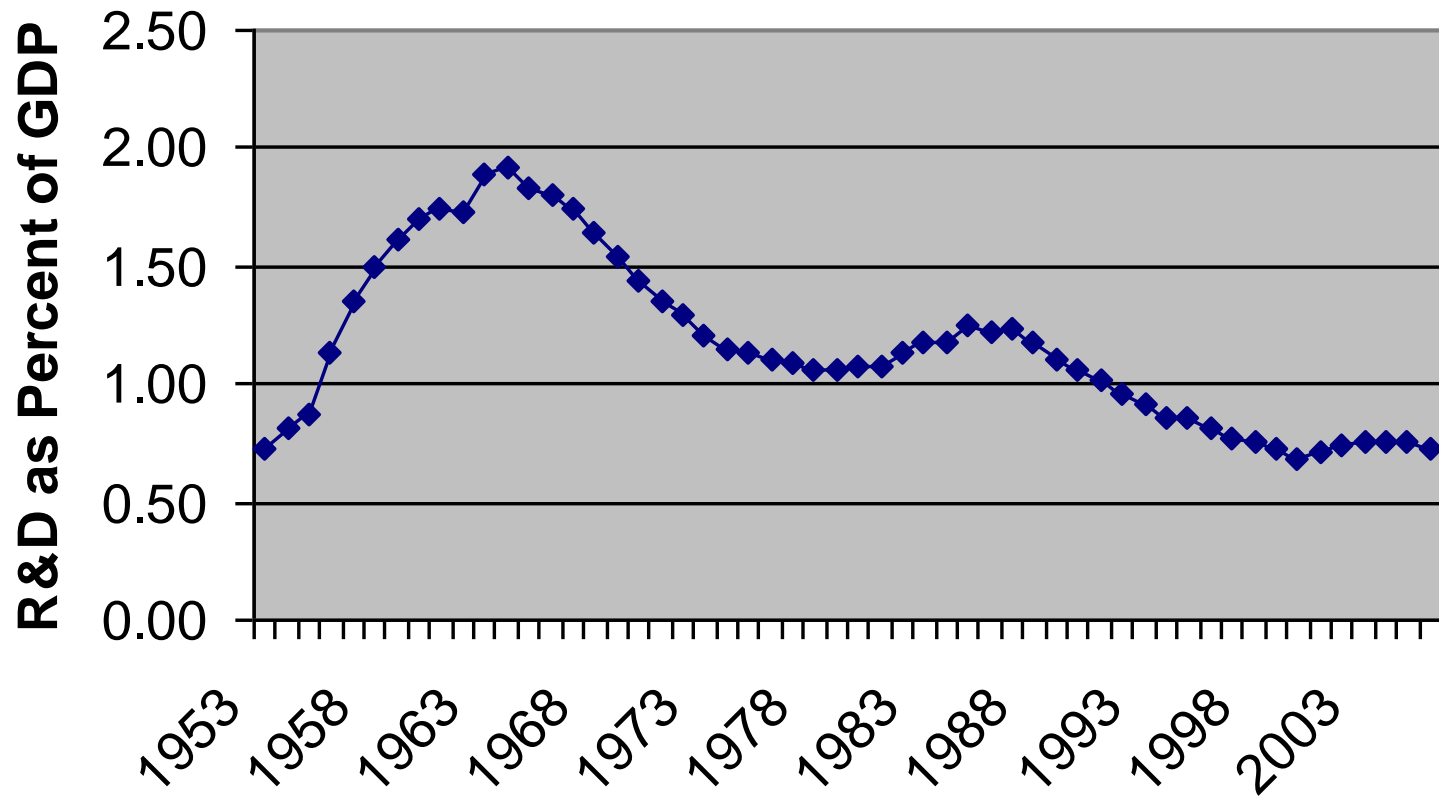
Globalization of Technology

Investment in R&D is a lead indicator of a nations intent to compete globally

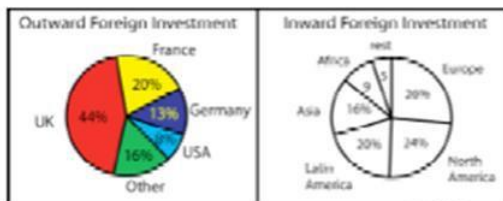
R&D investment over the past decade:

- China: doubled from .06% to 1.2%
- Israel: nearly doubled from 2.7% to 4.7%
- Finland: 3.5%
- Germany: 3.0% by 2010
- **United States: DECREASED 2% to .75% (1953-2006)**

How Do We Compare on the International Level ?

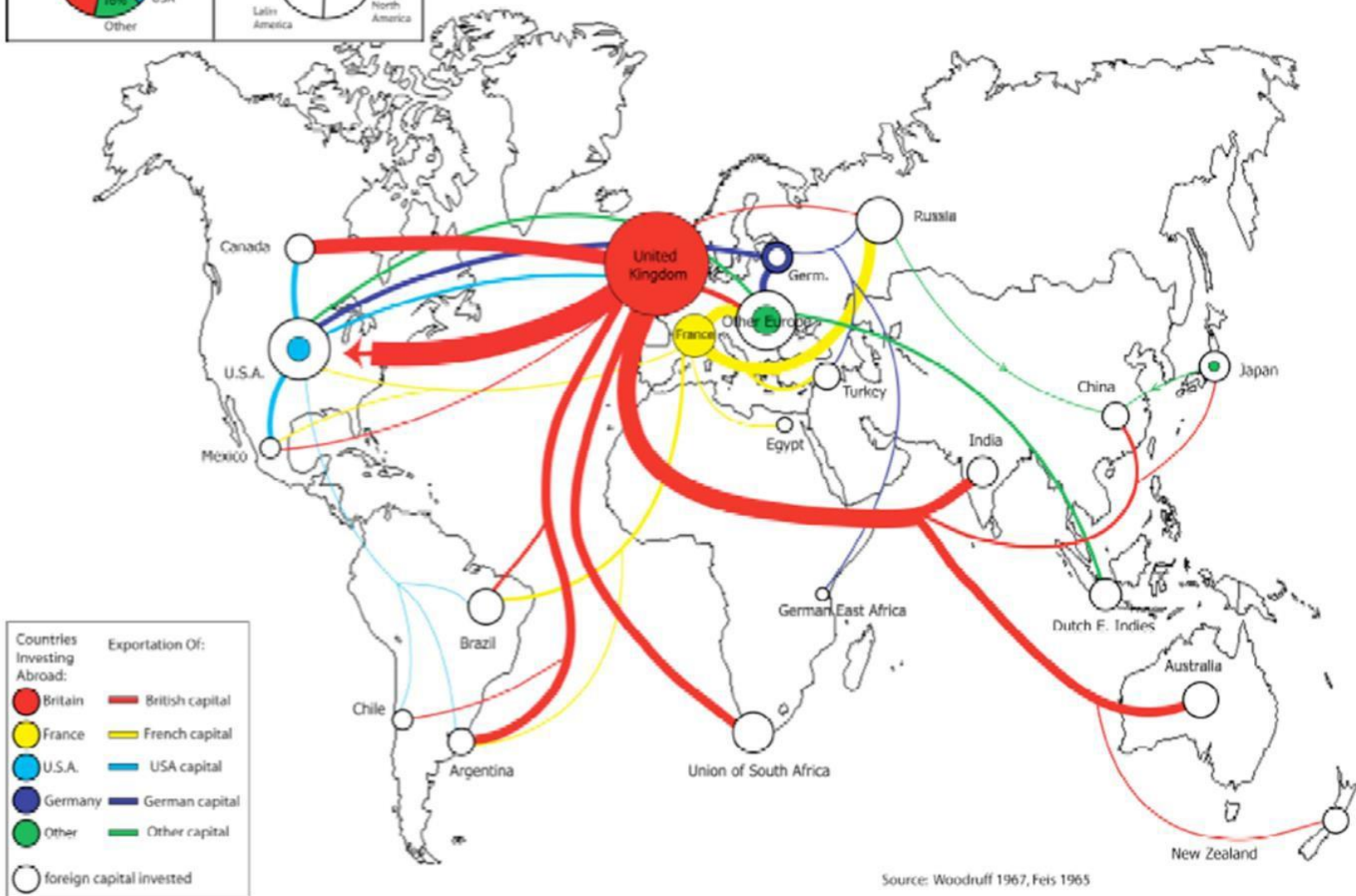


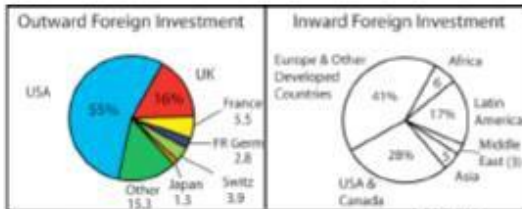
U.S. Federal R&D Support as Percentage of GDP (1953-2006)
Reduced from 2% to .75%



International Capital Investments in 1914

Total Foreign Direct Investment = \$667 Billion USD (2004 Dollars)

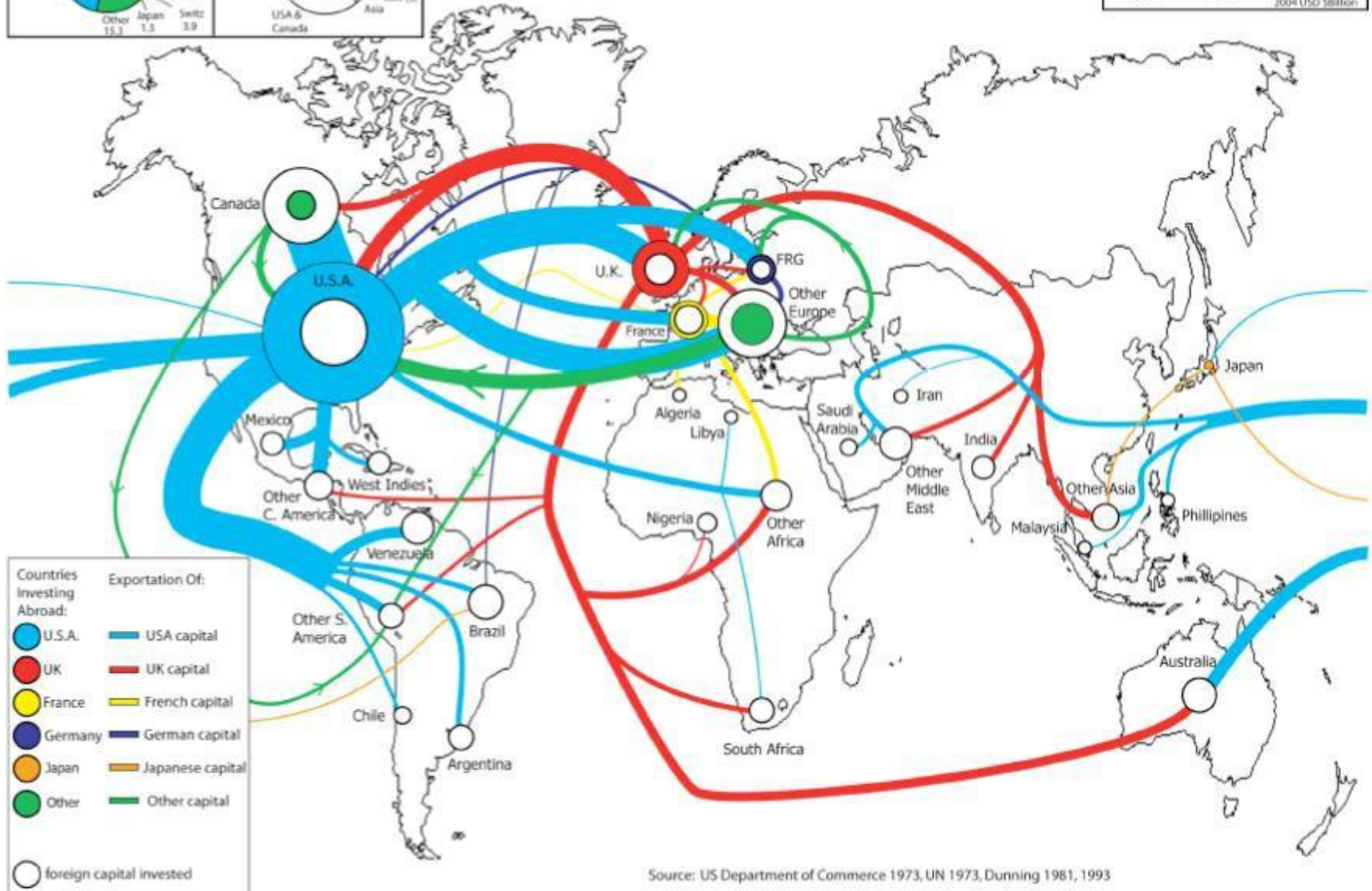




International Capital Investments in 1967

Total Foreign Direct Investment = \$494 Billion USD (2004 Dollars)

Avg. Annual Net FDI Outflow 1968-1970	
USA	12.07
UK	1.78
France	-0.28
FR Germany	0.85
Japan	0.75
2004 USD \$billion	



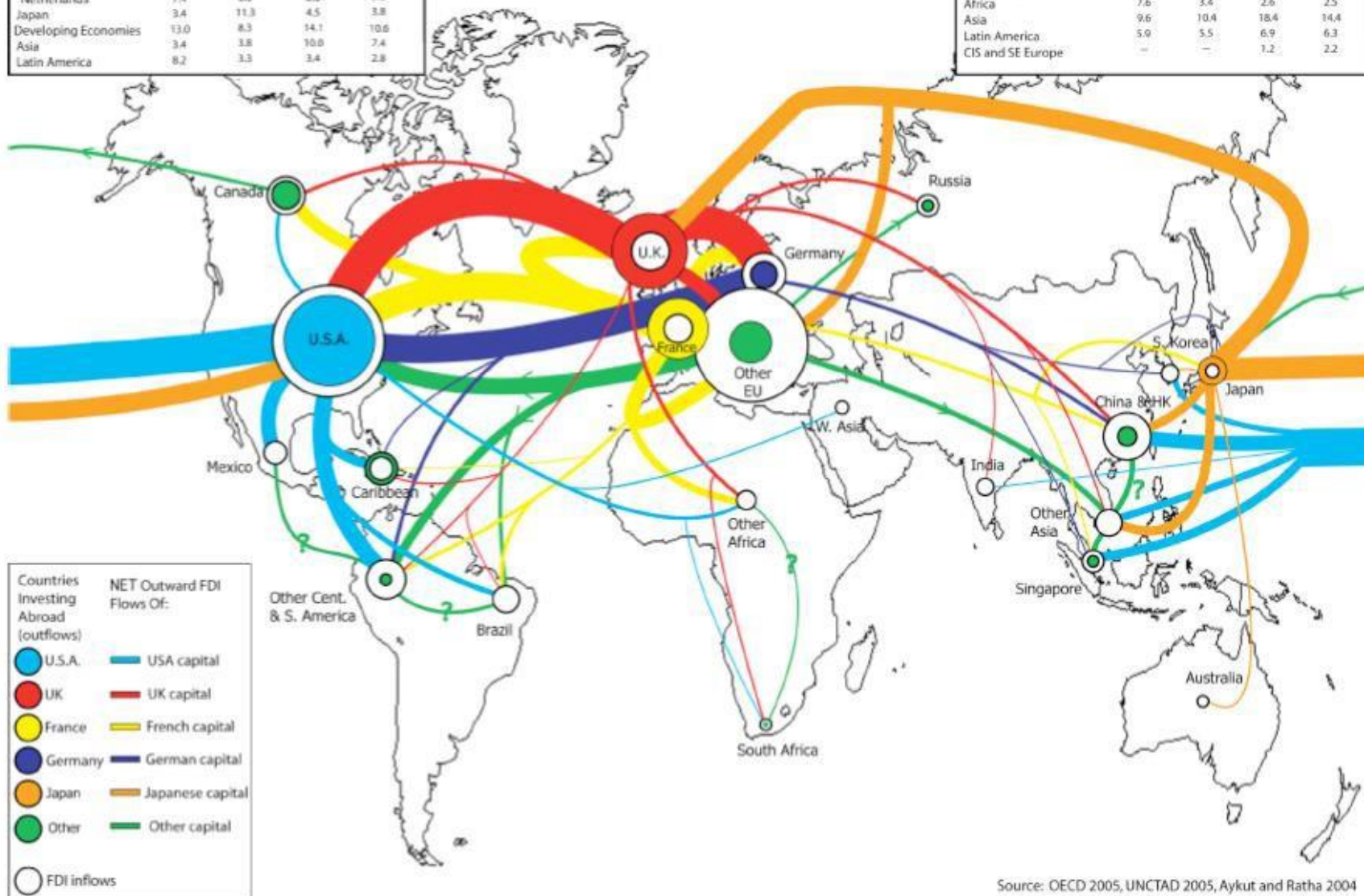
Source: US Department of Commerce 1973, UN 1973, Dunning 1981, 1993

Stocks of Outward FDI (% of world share)				
	1980	1990	2000	2004
Developed Economies	87.0	91.7	85.5	88.5
United States	37.8	24.1	21.4	20.7
Europe	41.2	49.4	54.1	58.1
United Kingdom	14.1	12.8	14.6	14.2
Germany	7.6	8.5	8.8	8.6
Netherlands	7.4	6.0	5.0	5.6
Japan	3.4	11.3	4.5	3.8
Developing Economies	13.0	8.3	14.1	10.6
Asia	3.4	3.8	10.0	7.4
Latin America	8.2	3.3	3.4	2.8

International FDI Flows 1999-2003 (Average Net Annual)

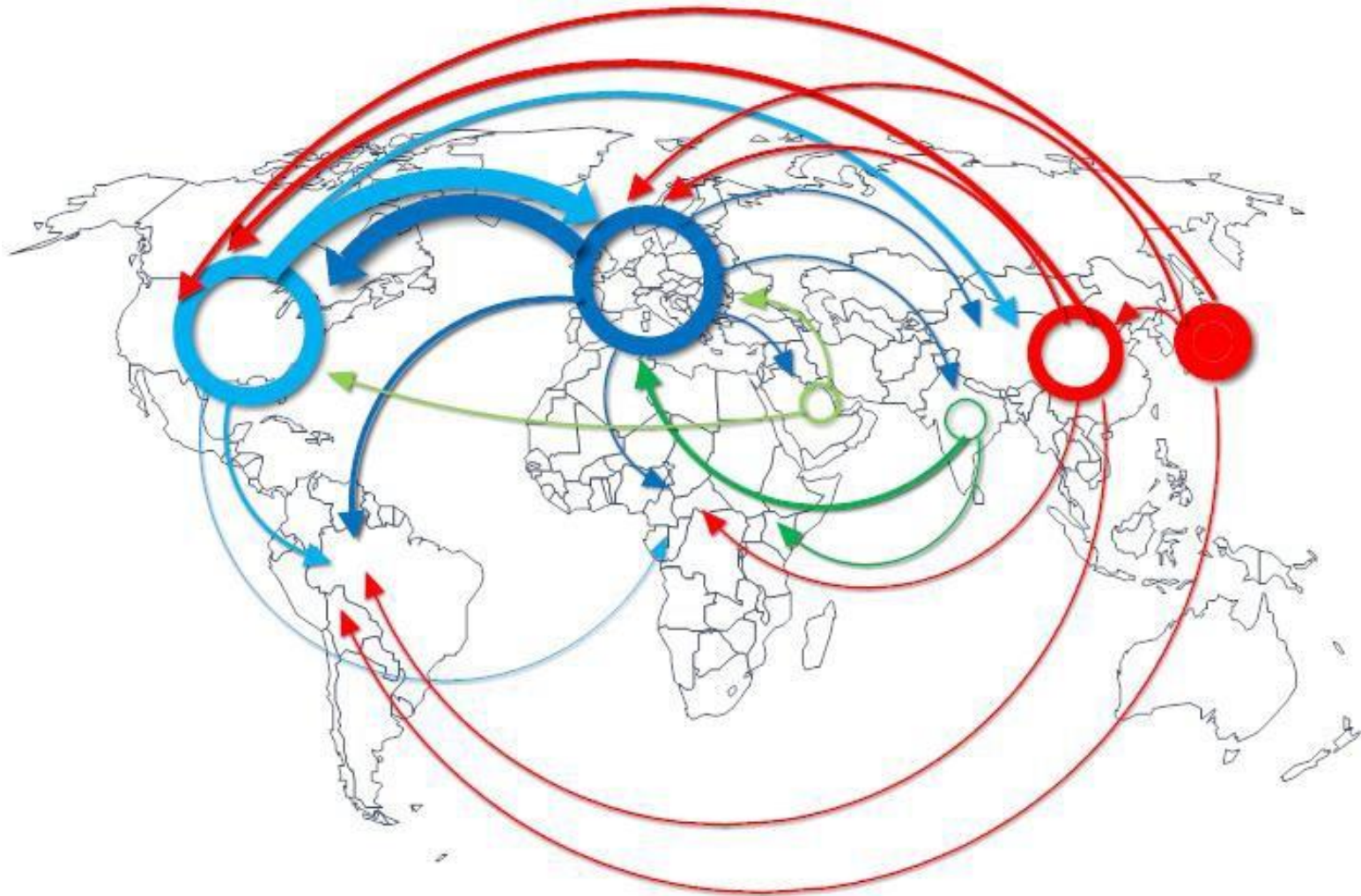
Total Outward FDI Stock in 2004 = \$9.732 Trillion

Stocks of Inward FDI (% of world share)				
	1980	1990	2000	2004
Developed Economies	75.1	79.4	68.8	72.7
United States	15.7	22.3	21.7	16.6
Europe	45.1	45.3	39.7	47.9
Japan	0.6	0.6	0.9	1.1
Developing Economies	24.9	20.6	30.0	25.0
Africa	7.6	3.4	2.6	2.5
Asia	9.6	10.4	18.4	14.4
Latin America	5.9	5.5	6.9	6.3
CIS and SE Europe	—	—	1.2	2.2



Source: OECD 2005, UNCTAD 2005, Aykut and Ratha 2004

CAPITAL INVESTMENTS 2012



Mauro F. Guillen. Source of the data: *World Investment Report*; *World Investment Directory*.

3. Advancing Innovation by Fostering Collaboration

Science Vision: Three Keys

- Great Technology
- Great Universities
- Great Entrepreneurs

Ben S. Bernanke
Chair, Federal Reserve Board
60 Minutes, March 2009

The Mixed Economy Collaboration Model

Old Model

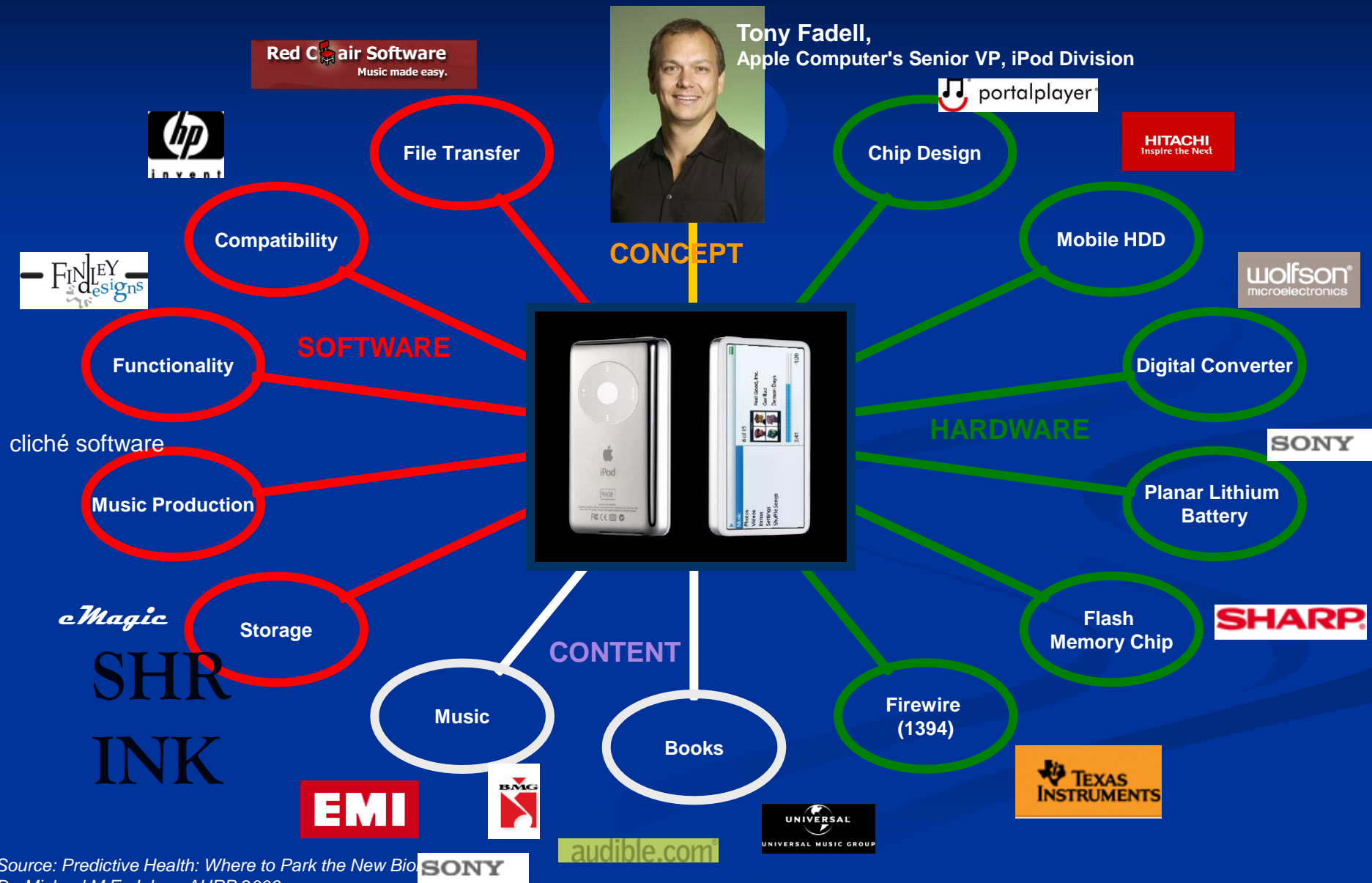
Government drives economic development through policy decisions and incentives.



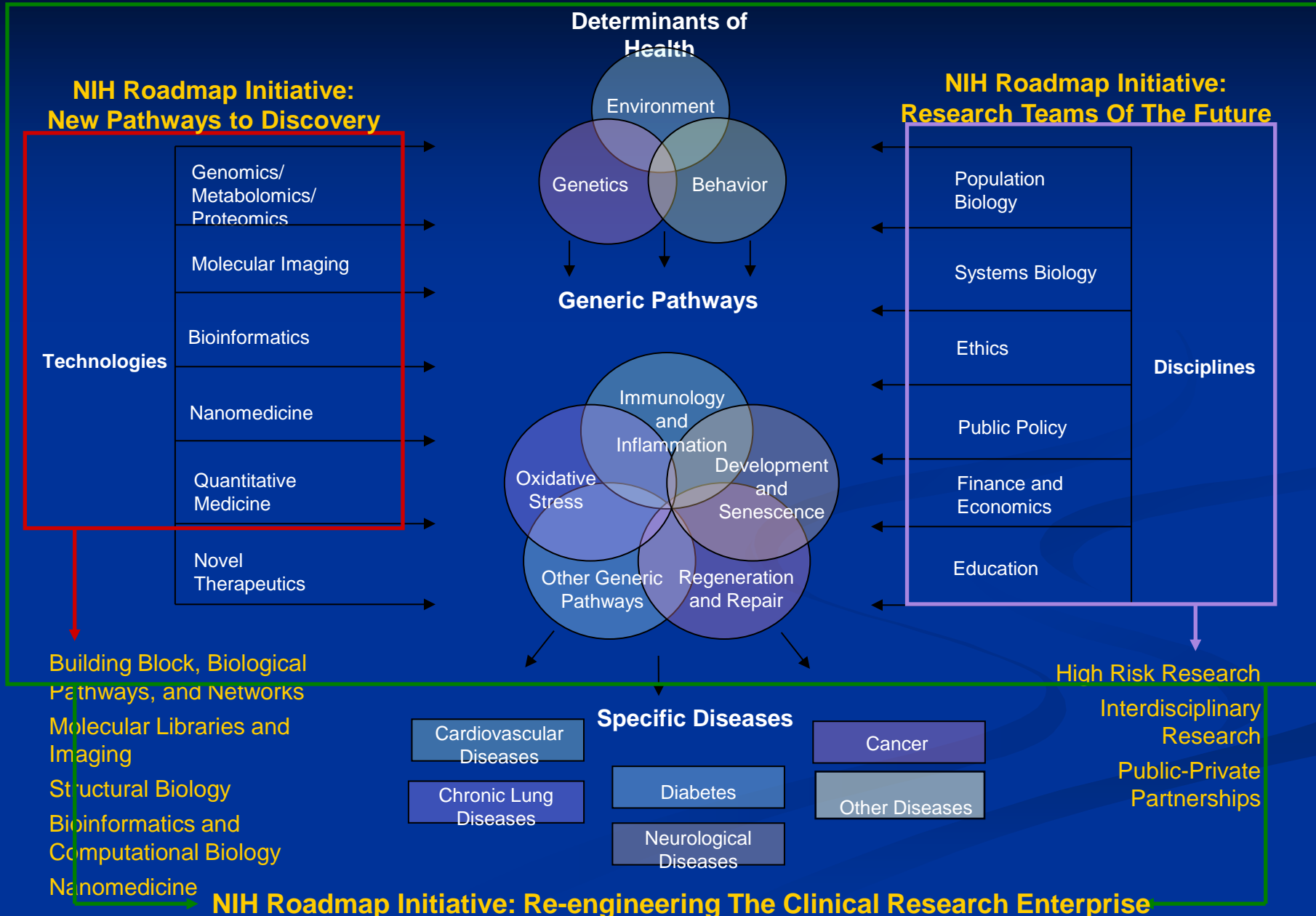
New Model

Economic development as a **collaborative process** involving government at multiple levels, companies, teaching and research institutions, and institutions for collaboration.

The New Collaboration Model: Developing the iPod



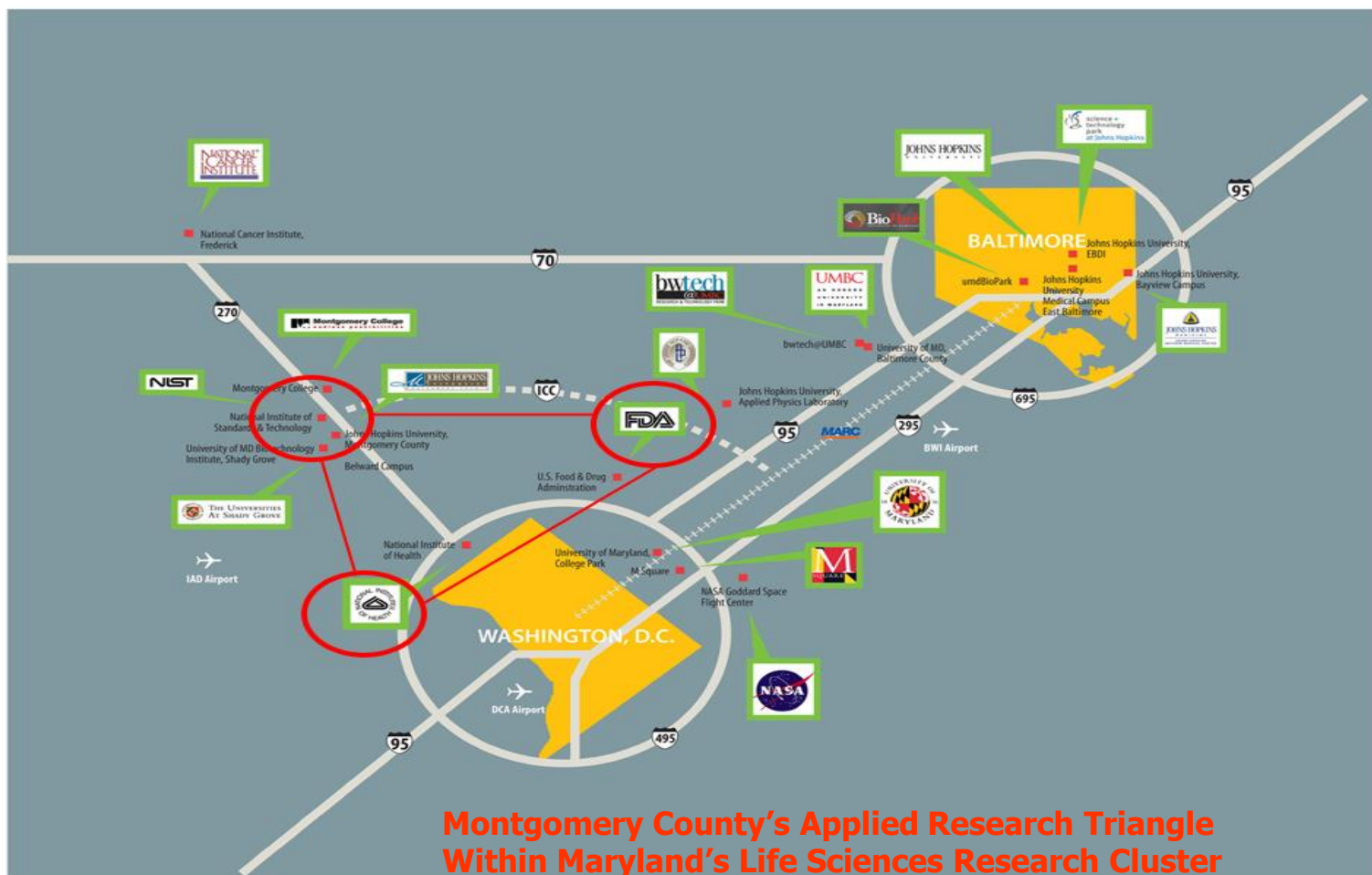
New NIH Collaboration Roadmap



4. Maryland Collaboration Model: BioHealth Innovation (BHI)

The Collaboration Model in Montgomery County

Federal Labs & the SGLSC Portal Mobilizing the Region's Applied Science Assets



Commercializing Regional BioHealth Research: Six Key Challenges To Be Addressed

- 1. Lack of Connectivity to Source Discoveries** in Federal & University & Biotech Labs
- 2. Lack of Expertise to Underwrite Prospects** To determine if a Discovery can meet both Proof of Concept and Proof of Relevance
- 3. Lack of Connectivity between Underwritten Prospects and the Capital Markets**, especially Early Stage Capital, preceding Angels, VCs & Commercial Debt & Equity
- 4. Lack of Connectivity to both Seasoned BioHealth Product Management Expertise and Serial Entrepreneurs** to Drive the Commercialization of Market Ready BioHealth NewCo prospects
- 5. Lack of Connectivity to Export BioHealth products to Domestic & Global Bioscience & Health Care Markets**
- 6. Lack of Effective Branding and Marketing** of the Montgomery County-Baltimore Region as a Leader in Commercializing BioHealth Discoveries

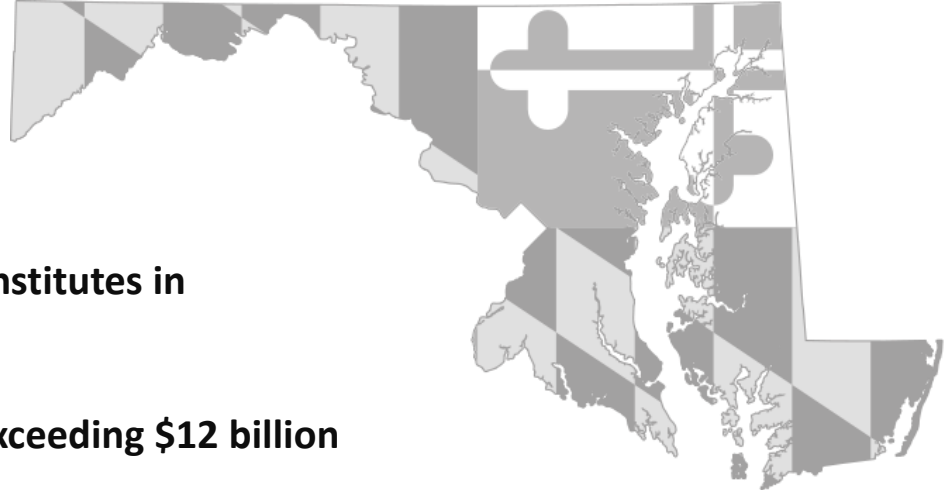


Entrepreneurial Universities: Culture and Ecosystems Track

Building the Regional Innovation Ecosystem

State of Maryland: Federal & University Resources

- **Population: 5.9 million people**
- **59 Federal Laboratories, Centers, & Institutes in Maryland**
- **Maryland Federal R&D investment exceeding \$12 billion annually**



JHU and USM represent another \$3.5 billion in annual R&D



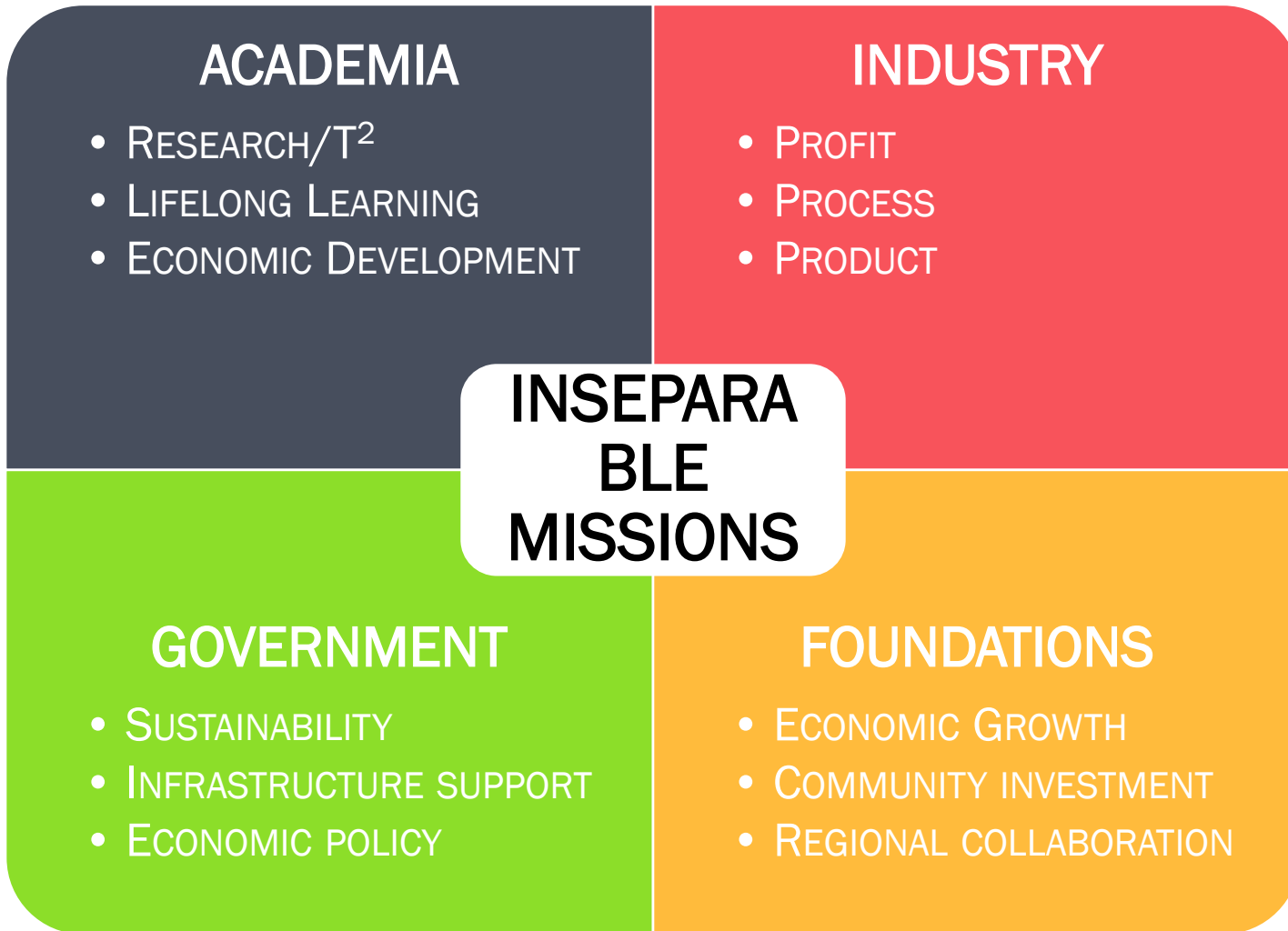
JOHNS HOPKINS
UNIVERSITY











BioHealth Innovation – Bridging the Gap



REGIONAL BIOHEALTH ECOSYSTEM PARTNERS



BOARD

 <p>Daniel J. Abdun-Nabi CEO, Emergent BioSolutions</p>	 <p>Judith Dunn VP, Global Head of Clinical Dev. Roche</p>	 <p>Douglas Liu Senior VP of GO Qiagen</p>
 <p>Michael J. Baader, Esq. General Counsel Greenspring Associates</p>	 <p>Jens Eckstein President SR One (GSK)</p>	 <p>Charles Morton Partner Venable LLP</p>
 <p>Richard A. Bendis President & CEO BioHealth Innovation, Inc.</p>	 <p>David M. Gillece (Secretary) Regional Managing Principal Cassidy Turley</p>	 <p>David Mott General Partner New Enterprise Associates</p>
 <p>Kenneth Carter Chair Noble Life Sciences</p>	 <p>Rick Ivey Vice President R&D BD Diagnostics</p>	 <p>John A. Sackett President Shady Grove Adventist Hospital</p>
 <p>Dave Lemus CEO Sigma-Tau Pharmaceuticals</p>	 <p>Joel Marcus CEO & Founder Alexandria Real Estate</p>	 <p>J. Thomas Sadowski President & CEO EAGB</p>
 <p>Chris Callaghan Group VP, Healthcare Banking M&T Bank</p>	 <p>Beth Meagher Principal Deloitte Consulting LLP</p>	 <p>Reginald Seeto VP, Partnering and Strategy MedImmune</p>
 <p>Ronald J. Daniels President Johns Hopkins University</p>	 <p>William E. Kirwan Chancellor University System of MD</p>	 <p>Thomas Street ACAO MoCo Government</p>

OUR PARTNERS

Private Sector



Government



Academia



NGOs



WHAT BHI DOES



Industry

- > Therapeutics
- > Diagnostics
- > Medical Devices
- > Healthcare Services
- > E-Health
- > Mobile Health
- > Electronic Medical Records
- > Health Informatics
- > BioHealth Cyber Security

Geography



Central
Maryland



USA



Global

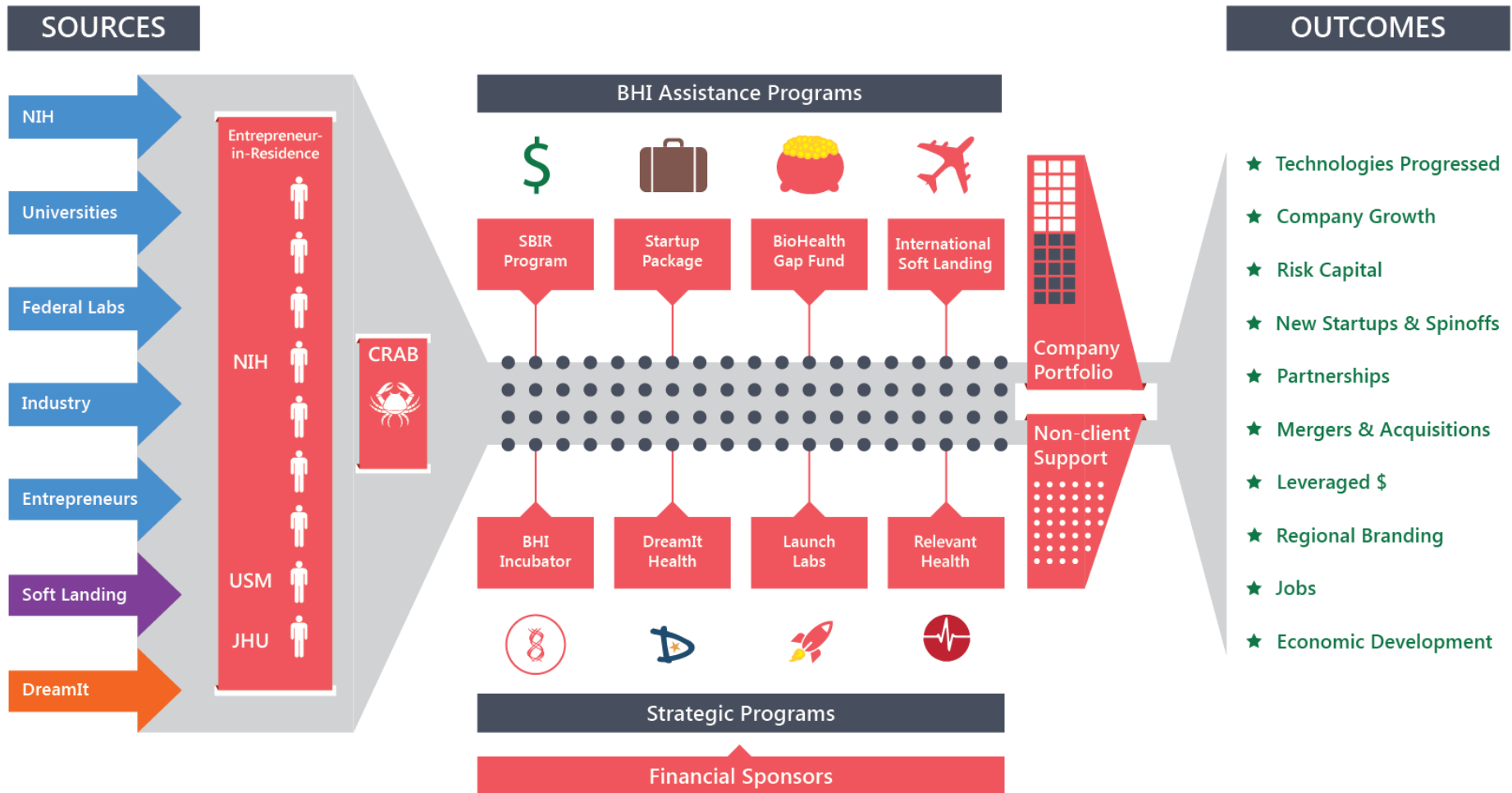


- Private
- Government
- Academia
- NGO

BHI is a private public partnership governed and managed by the private sector. Our mission as an innovation intermediary is to:

- 1 Advance Technologies
- 2 Accelerate Innovation
- 3 Globally Connect

BHI BUSINESS MODEL

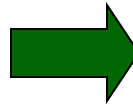
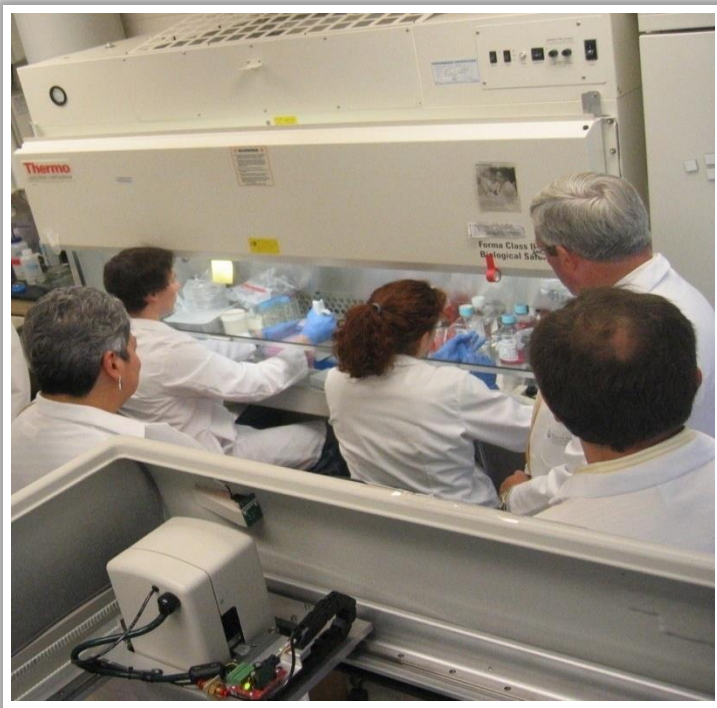


Innovation Paradigm Shift

PROOF OF CONCEPT
(Technological Feasibility)

Laboratory Push

“It Works!”



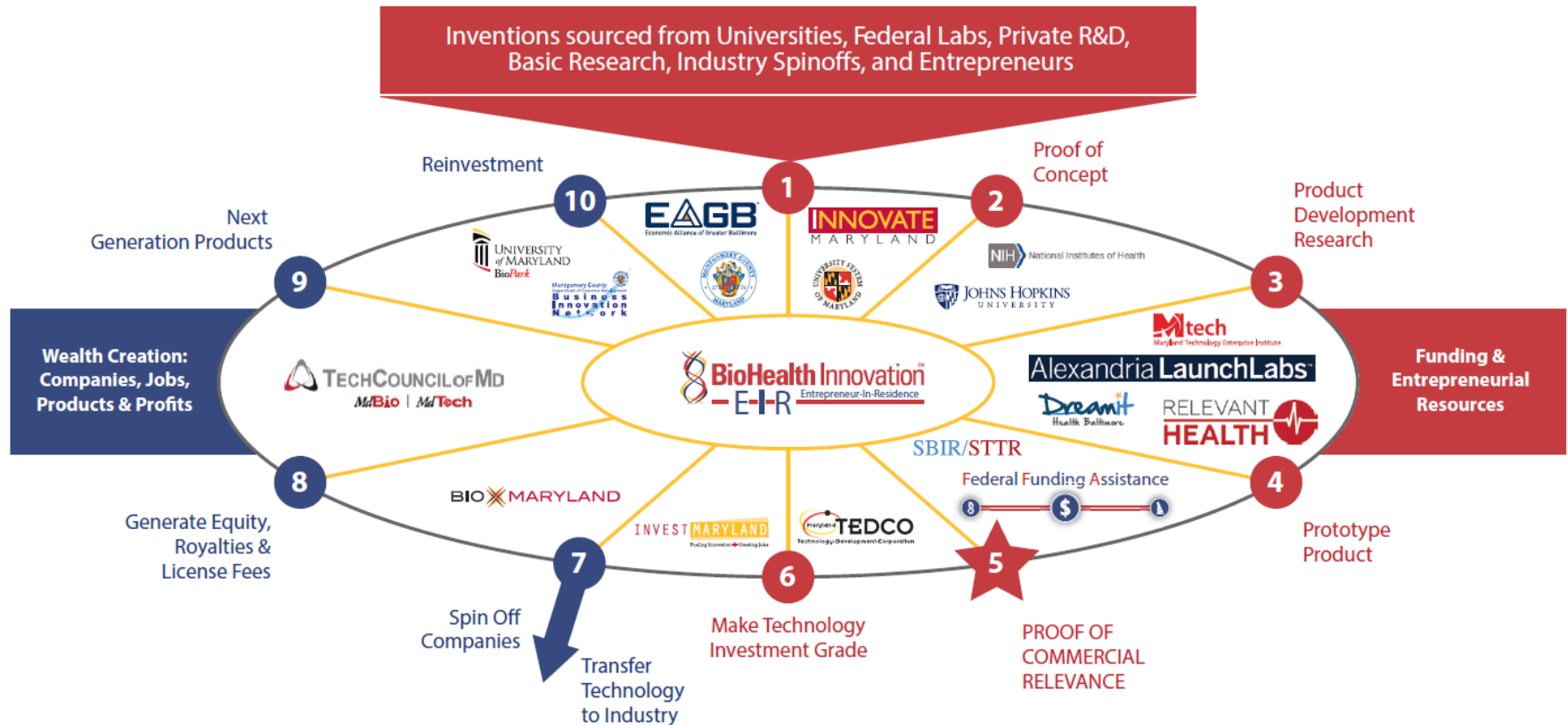
PROOF OF COMMERCIAL RELEVANCE
(Market Pull)

“It Works To Solve A Problem”

“I’ll Buy It”



BHI Commercialization Model



WHERE WE EXCEL

Entrepreneur-in-Residence Program

1

Experienced Entrepreneurs, Venture Capitalists and Industry business developers managing a commercially relevant biohealth portfolio.



Todd
Chappell (NIH)



Ram
Aiyar (NHLBI)



Ken
Malone (USM)



Albine
Martin (JHU)



Ethel
Rubin (NHLBI)



Steve Wolpe
(NHLBI)



Additional NIH
EIRs

BHI Scouting Clients



BHI Partners

Replicable to **ANY** Region

Innovation Capital Map



Capital Sources by Investment Stage

Pre-Proof of Concept \$25,000 - \$1,500,000 (over 5 yrs)	Translational Research/ Proof of Concept \$15,000 - \$750,000 (over 3 yrs)	Proof of Commercial Relevance/Pre-Seed \$15,000 - \$500,000	Seed/ Start-Up \$50,000 - \$1,500,000	Early Stage \$200,000 - \$2,500,000	Later Stage \$2,500,000+
<ul style="list-style-type: none"> NIH R01 NIH R03 NIH R21 Maryland Stem Cell Research Fund (MSCRF) - Various 	<ul style="list-style-type: none"> ★ SBIR/STTR Federal Funding Assistance Program SBIR/STTR Grant Phase 1 NCATS Cures Acceleration Network (CAN) Maryland Stem Cell Research Fund (MSCRF) - Various TEDCO Technology Validation Program - Proof of Concept TEDCO Maryland Innovation Initiative - Phase 1 JHU - Coulter Translational Research Partnership 	<ul style="list-style-type: none"> Maryland Industrial Partnerships (MIPS @ UMD) TEDCO Maryland Innovation Initiative - Phase 2 Maryland Stem Cell Research Fund (MSCRF) - Pre-Clinical TEDCO Technology Validation Program - Market Assessment SBIR/STTR Phase 2 	<ul style="list-style-type: none"> Dingman Center Angels (UMD) BioMaryland Biotechnology Dev. Award - Translational Research TEDCO Patent Assistance Program TEDCO Technology Commercialization Fund TEDCO Maryland Innovation Initiative - Phase 3 SBIR/STTR Phase 2 ★ BioHealth Gap Fund 	<ul style="list-style-type: none"> Propel Baltimore Fund TEDCO Veterans' Opportunity Fund Invest Maryland: Maryland Venture Fund BioMaryland Biotechnology Dev. Award - Commercialization Abell Venture Fund MIMG Ventures LLP TDF ★ BioHealth Gap Fund 	<ul style="list-style-type: none"> Maryland Venture Fund Authority ABS Capital Partners Greenspring Associates Novak Biddle Venture Partners Sterling Venture Partners Harbert Venture Partners JMI Equity New Enterprise Associates (NEA)

Funding Type Key

- Academic
- State of Maryland
- ★ BioHealth Innovation, Inc.
- Federal
- Economic Development
- Private Capital

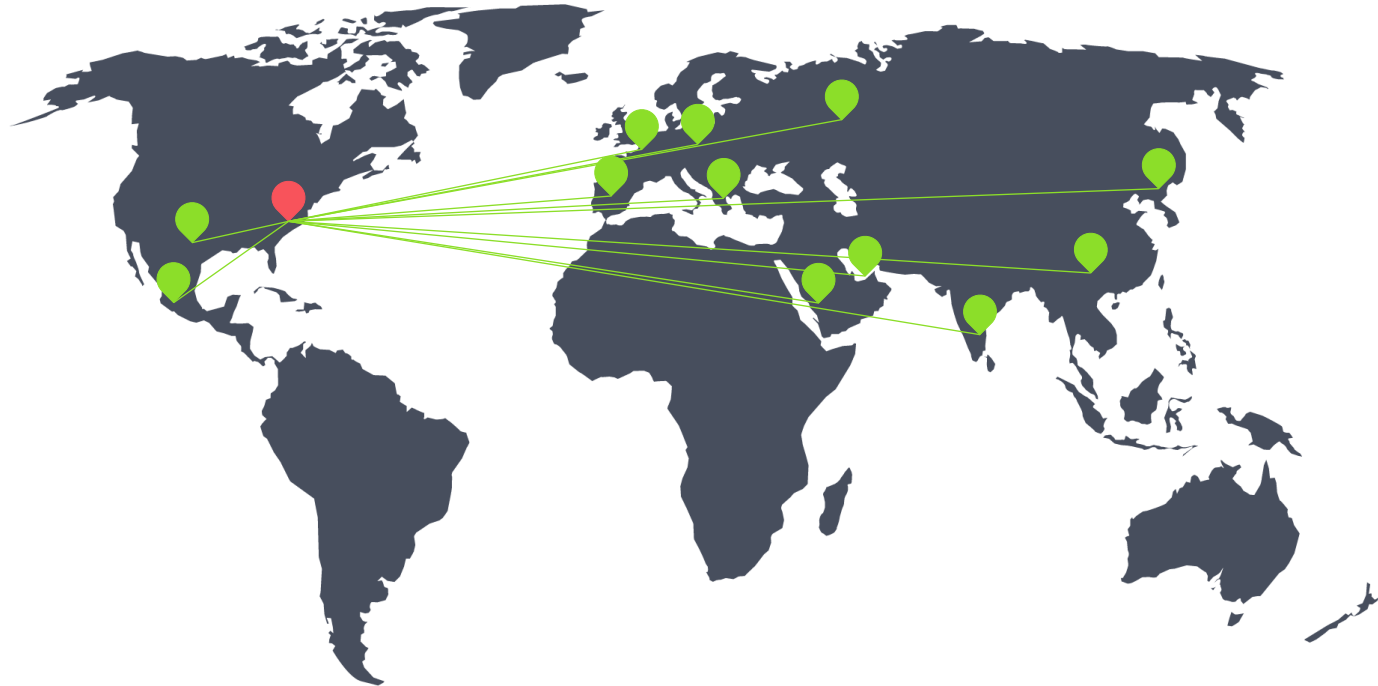
Tax Credits

- Maryland Biotechnology Investor Tax Credit
- Montgomery County Biotechnology Investor Tax Credit

OPPORTUNITIES FOR COLLABORATION

Connections

- > Regional
- > National
- > Global
- > Partners
- > Board Members
- > Collaborators



BHI Clients receive **FULL** Network Access



BioHealth InnovationSM
Maryland's Commercialization Collaborative

Global BioHealth Institute Proposal

David McDonough, BS, MS

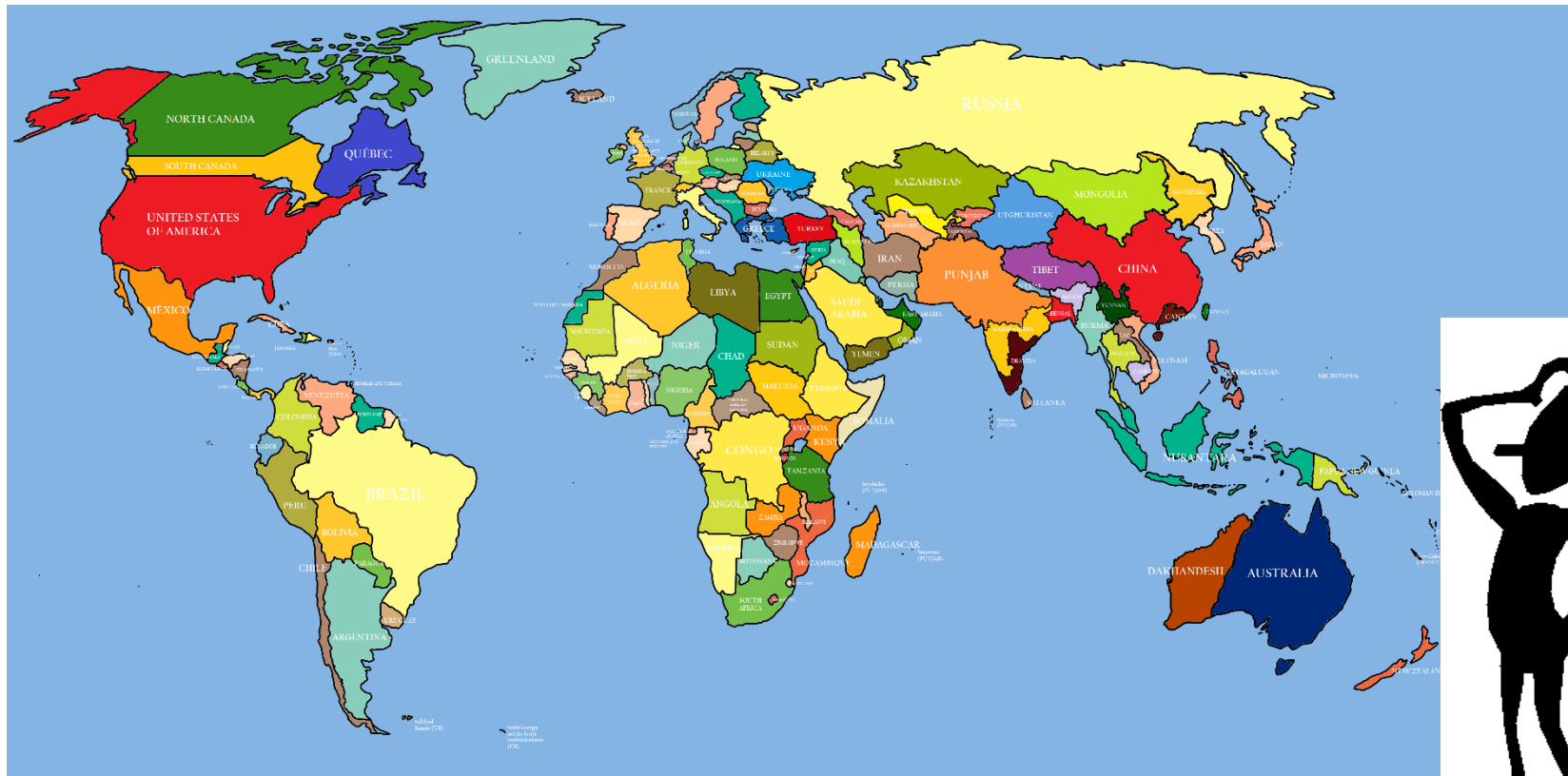
Ethel Rubin, PhD

October 12, 2015

Problem: Connecting technologies to markets

Overwhelming difficulty in exporting medical innovations outside US and WE CAN geographies

- Lack of knowledge of OUS opportunities and markets
- Bio- and med tech companies without Regulatory and global commercialization expertise



Where to next and how do we get there?

Solution: Global BioHealth Institute @ Montgomery county

- ❖ Market research - Provide market demand & opportunities
 - Epidemiologic data (WHO) combined with political & socioeconomics
 - Sort: Payers, Healthcare delivery networks, trade agreements, IP protection
- ❖ Match technology to applicable markets
 - Clinical evidence guided market entry (NICE, AHRQ models)
- ❖ Gain access to markets
 - Stakeholder integration: state dept, public private partnerships/Health-W model
- ❖ Commercial sales
 - Establish and execute purchase orders for US technologies
- ❖ Create repeatable system for market entry
 - Regulatory/product registration
 - Payers, Providers, Distributors, Healthcare networks
 - Import/Export



5. Land Use Vision to Advance Science & Innovation in Montgomery County

GSSC: A New BioScience Community

advancing

Health for the World



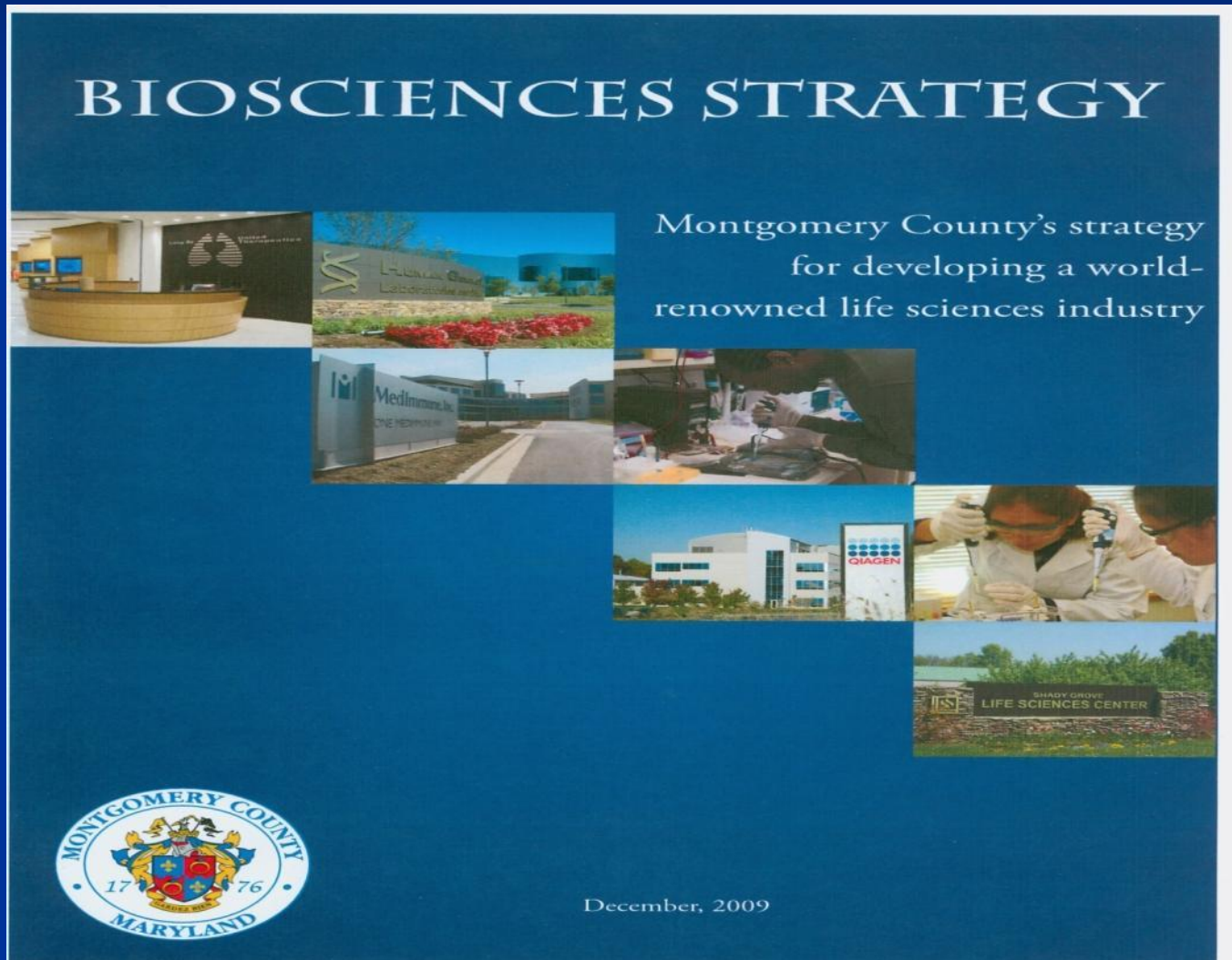
DARIUSHOC.COM 08

Advancing Science Generating Jobs
Creating a Great Place to Live and Work

GSSC: A New BioScience Community advancing Health for the World

- Advancing Health, Science and Education
 - The pre-eminent Biotech Center in the US and the World
 - Attracting the “Best and Brightest”
- Fostering Collaboration across Government, Higher Education and Industry
 - 60,000 science based jobs and support positions over the next 30 years
- Great Place to Live and Work and Play
 - Dynamic mix of residential, commercial, recreational, cultural uses
 - Transit Oriented, smart growth, green sustainable design

Economic Development Plan: Applied Science Commercialization Plan Linking Industry, Government, Universities & Capital Markets



Land Use Plan: 900 Acre, Transit Oriented, Mixed Use Master Plan

June 2010
approved and adopted

great seneca science corridor master plan The Life Sciences Center



 **Montgomery County Planning Department**
The Maryland-National Capital Park and Planning Commission

MontgomeryPlanning.org

Transformational Visions For Shady Grove



SGLSC 20 Years Ago



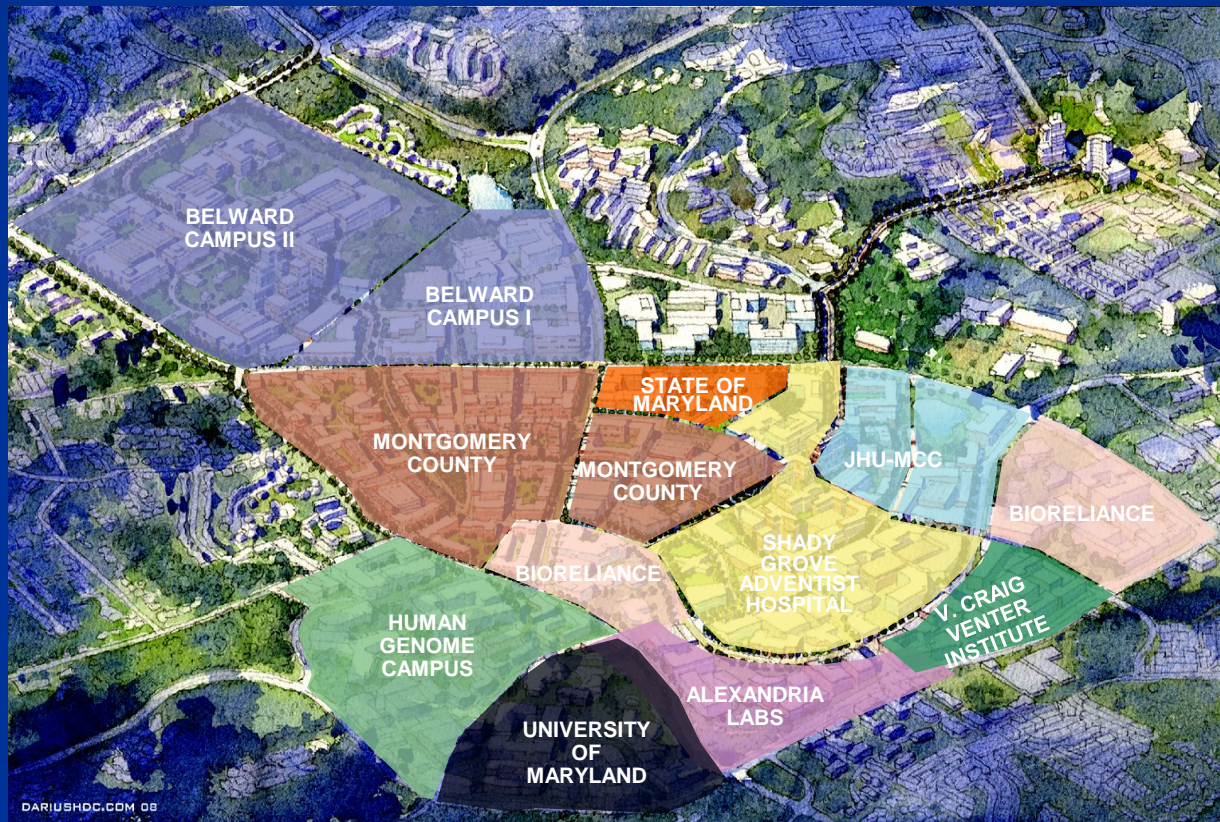
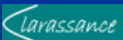
SGLSC Today



SGLSC in 20 Years – Vision 2030

Merging Land Use and Economic Development to Advance Domestic and Global Applied Science

BIOTECH COMPANIES



CANCER RESEARCH FACILITIES



Planning for Science in the 21st Century

County Planning Principles

1. Work



2. Access



3. Life



4. Health



5. Design



GSSC Planning Principles

State-of-the-art research, health care, jobs

Mass Transit, integrated street network

Mixed-use, walk to work, retail and recreation,
workforce housing

Walkable Streets, public parks and plazas

World-class, integrated, transit-oriented

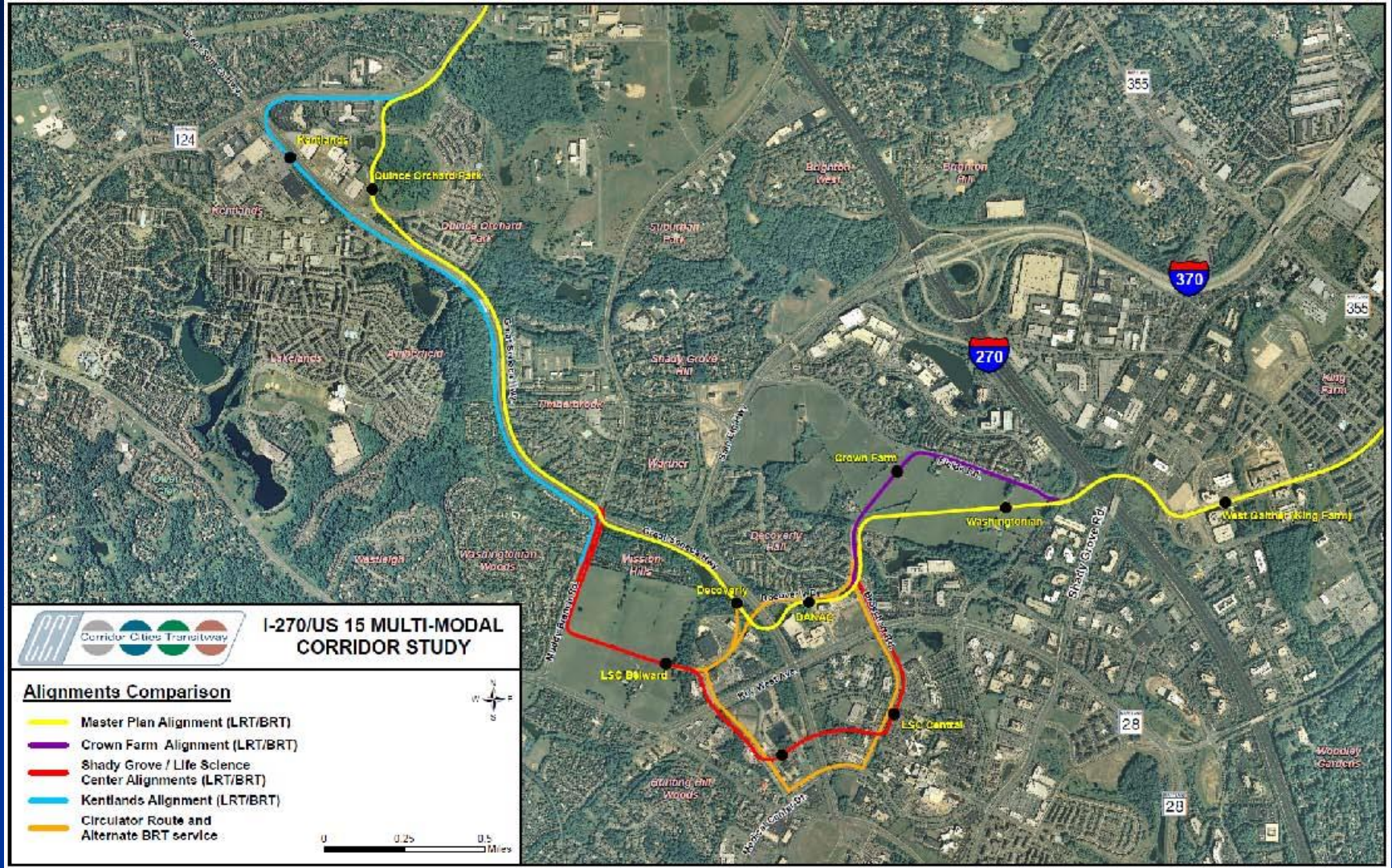


1. Work – Attracting the Creative Class

Harvard Square, Cambridge, MA



2. Access: The Corridor Cities Transitway



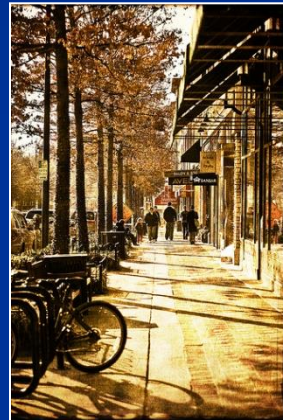
3. Life: Mixed Use Residential, Retail & Recreation

- Walk to work encouraged through the incorporation of workforce housing. (Walk to work target ratios: 25% walk or bike within precinct, 25% transit, 50% automobile)
- Mix of uses creates a vibrant community, with neighborhood-serving retail and recreation opportunities.
- Park system is developed for passive and active recreation

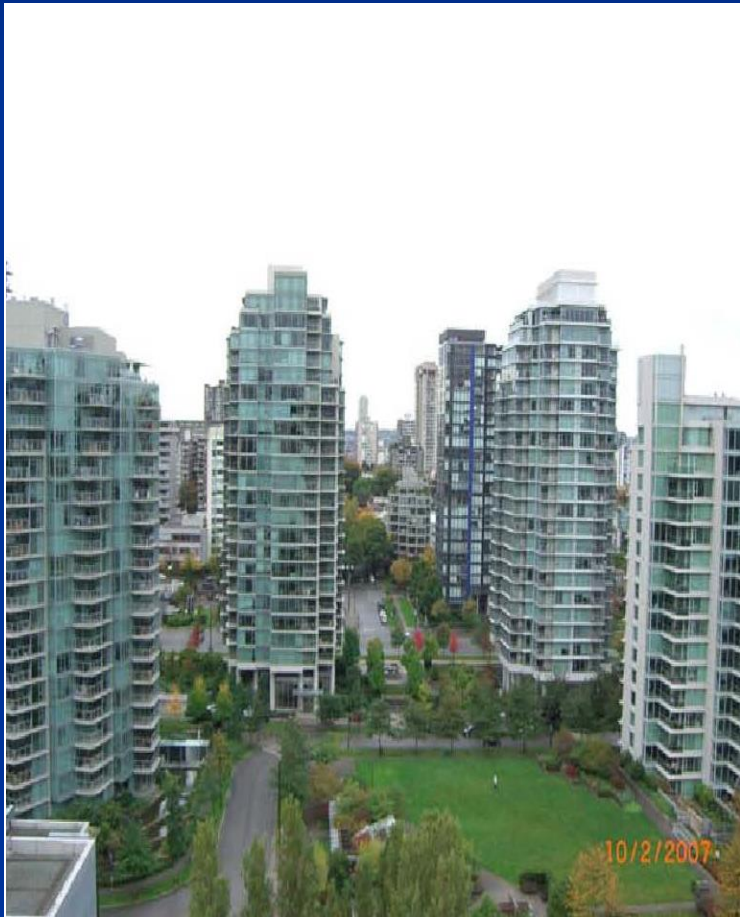


3. Life : New SGLSC Retail

Mixed Uses = Vibrant Town Centers



3. Life – SGLSC Work Force and Senior Housing 8,000 New Multifamily Dwelling Units

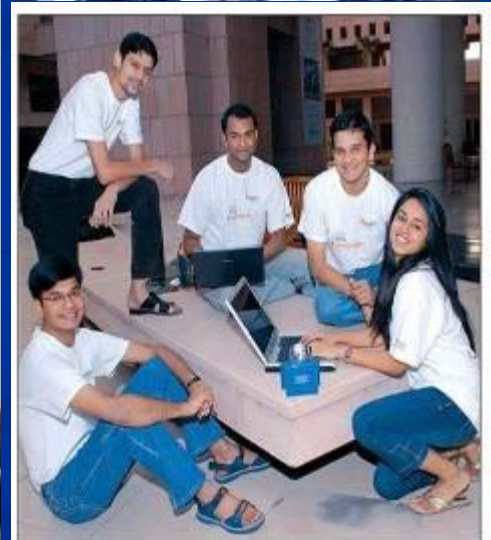


Vancouver, Approx 50 DU/acre



Connecticut Ave, 30 – 40 DU/acre

3. LIFE & WORK – Link the Applied Research Community with the Public Schools



4. Health – Local Amenities



Neighborhood Shopping & Entertainment

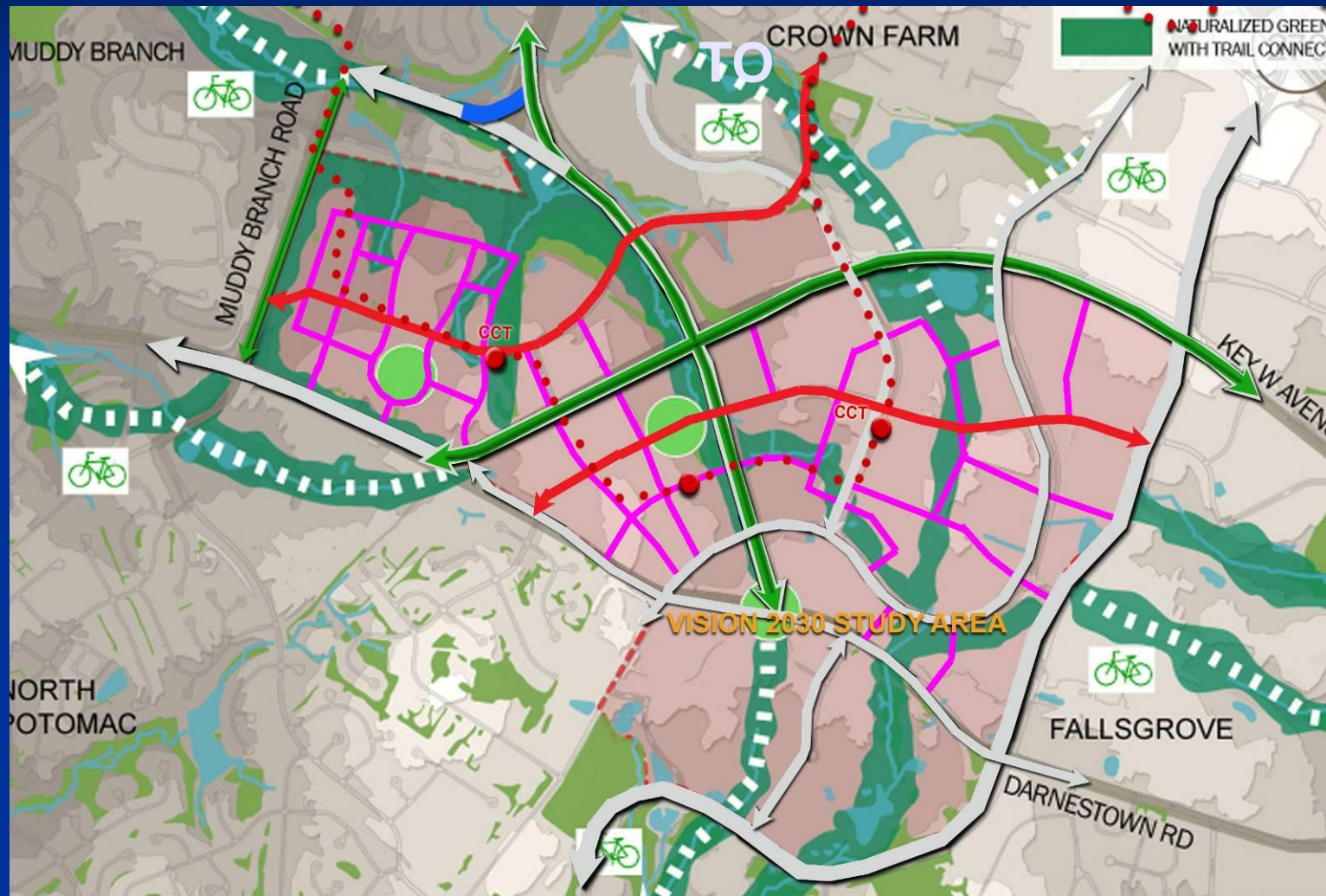


Cultural Facilities

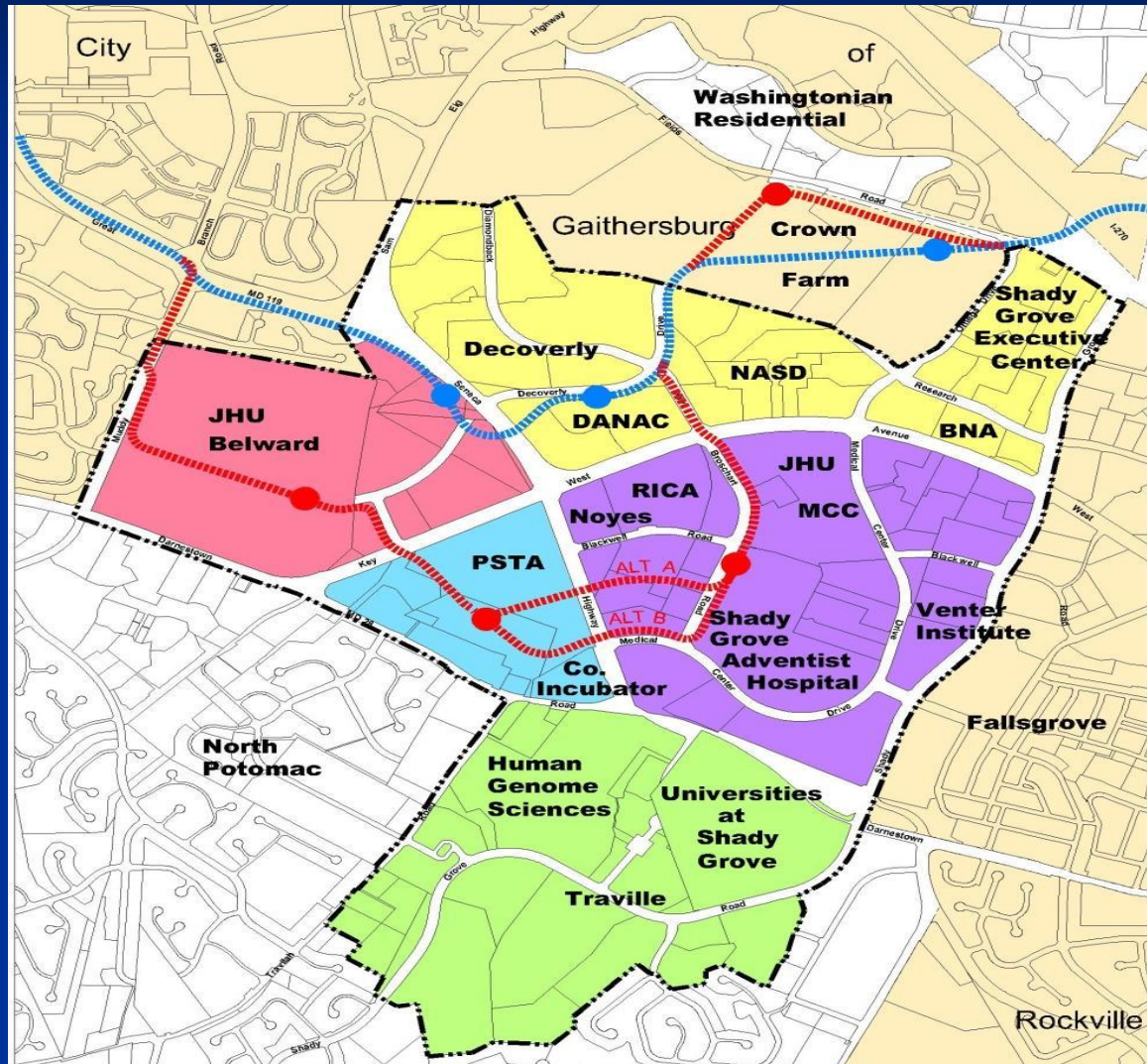


5. Design – Link Open Space, Roads and CCT

Link CCT, Streets and Open Space to Promote Walking, Biking and Transit Ridership



GSSC Master Plan Summary



GSSC Master Plan

Transit Oriented, Mixed Use, Research Community



6. Economic Development Benefits

Land Use Plan: 900 Acre, Transit Oriented, Mixed Use Master Plan

June 2010
approved and adopted

great seneca science corridor master plan The Life Sciences Center



 **Montgomery County Planning Department**
The Maryland-National Capital Park and Planning Commission

MontgomeryPlanning.org

GSSC Economic Development Benefits for the State of Maryland

The new GSSC Master Plan for an **Applied BioScience Research Community** to generate, over the next 20 years*:

- 101,000 new annual full and part time science related jobs
- \$13 billion in annual goods and services for businesses
- \$322 million in annual State tax revenues

* Sage Policy Group Draft Vision 2030 Economic Impact Analysis, June, 2008